Salazar de Pablo, G., Vaquerizo, J., Catalan, A., Arango, C., Moreno, C., Ferre, F., Il Shin, J., Sullivan, S., Brondino, N., Solmi, M., & Fusar Poli, P. (2020). Impact of coronavirus syndromes on physical and mental health of health care workers: Systematic review and meta-analysis. *Journal of Affective Disorders*, *275*, 48-57. https://doi.org/10.1016/j.jad.2020.06.022

SUPPLEMENTARY MATERIAL

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable I: Prisma statement and checklist

Section/topic	#	Checklist item	Page
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	3
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	4
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	4
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	4
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5

Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	5, e30
Summary measures	13	State the principal summary measures	5
Risk of bias across studies	15	Specify any assessment of risk of bias (i.e. Newcastle-Ottawa Scale (NOS), that may affect the cumulative evidence.	5,e30
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	5
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	6, 14
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	e9-26
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment.	e9-26
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study a summary data for each intervention group.	e9-26
Synthesis of results	21	Present results of study analysed.	6-7
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies	7
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression	6-7
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	7-12
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	12-13
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support; role of funders for the systematic review.	13

eTable II: Moose checklist

Criteria		Brief description of how the criteria were handled in the meta-analysis
Reporting of background should include		
√	Problem definition	No meta-analysis has evaluated the scope of the most commonly reported physical and poor mental health outcomes in professionals exposed to SARS/MERS/COVID-19.
√	Hypothesis statement	We hypothesized that both physical and mental health would be affected in health care workers.
√	Description of study outcomes	Studies were described in the supplementary table.
√	Type of exposure or intervention used	Exposure to contact with SARS/MERS/COVID-19 as detailed in eMethods 2.
√	Type of study designs used	Both cross sectional and longitudinal studies were included. Design detailed in methods section.
√	Study population	Subjects in contact with or infected by SARS/MERS/COVID-19.
Reporting of search strategy should include		
√	Qualifications of searchers	The credentials of the investigators are indicated in the author list.
√	Search strategy, including time period included in the synthesis and keywords	We performed a multi-step literature search using the keywords described in the methods section until 15th April 2020. Given that this field is rapidly developing, we searched the preprint servers medRxiv, psyArXiv and bioRxiv for the terms ‘coronavirus’ or ‘COVID-19’ from 1st January 2020 until 15th April 2020.
√	Databases and registries searched	Web of Science database (Web of Science Core Collection, BIOSIS Citation Index, KCI-Korean Journal Database, MEDLINE, Russian Science Citation Index, and SciELO Citation Index)
√	Use of hand searching	References of systematic reviews or meta-analyses that were screened during literature search and the references from the included studies were manually searched.
√	List of citations located and those excluded, including justifications	Details of the literature search process are outlined in the results section and PRISMA flowchart.
√	Method of addressing articles published in languages other than English	Only articles in the English language were selected.
√	Method of handling abstracts and unpublished studies	Original individual studies were included; reviews, clinical cases, grey literature and study protocols were excluded.
√	Description of any contact with authors	We did not contact authors.
Reporting of methods should include		
√	Description of relevance or appropriateness of studies assembled for assessing the hypothesis	Detailed inclusion and exclusion criteria are described in the methods section.

√	Rationale for the selection and coding of data	Data extracted from each of the studies are relevant to the population characteristics, study design and study outcomes.
√	Assessment of confounding	We did not investigate confounding factors, as stated in the limitations section.
√	Assessment of study quality and stratification or regression on possible predictors of study results	We evaluated the quality of the included studies using Mixed Methods Appraisal tool. We performed subanalysis and meta-regressions of main potential predictors.
√	Assessment of heterogeneity	Heterogeneity was assessed with the I^2 index.
√	Description of statistical methods in sufficient detail to be replicated	A random-effects meta-analysis was used. Heterogeneity among study point estimates was assessed using Q statistics. The proportion of the total variability in the effect size estimates was evaluated with the I^2 index.
√	Provision of appropriate tables and graphics	We included the PRISMA flow-chart and several tables to describe the literature search and its results.
Reporting of results should include		
√	Table summarizing individual study estimates and overall estimate	We reported this in the results and supplementary section.
√	Table giving descriptive information for each study included	We have presented descriptive information for each study in the tables and as supplementary material.
√	Results of sensitivity testing	Subgroup analyses were conducted as specified in the manuscript.
√	Indication of statistical uncertainty of	We reported this in the results section.
Reporting of discussion should include		
√	Quantitative assessment of bias	Bias was quantitatively assessed and reported in the supplementary material.
√	Justification for exclusion	We excluded studies based on the rationale of the meta-analysis.
√	Assessment of quality of included studies	The quality of the studies was assessed and reported.
Reporting of conclusions should include		
√	Consideration of alternative explanations for observed results	We have addressed this point in the discussion section.
√	Generalization of the conclusions	We have addressed this point in the discussion section.
√	Guidelines for future research	We have addressed this point in the discussion section.
√	Disclosure of funding source	Funding source was specified.

eTable III: Reasons for exclusion during full- text screening

Study	Reason for exclusion	Study	Reason for exclusion
(Chan-Yeung, 2004)	No desired design	(Bein et al., 2020)	Language not English
(Chang et al., 2020)	No desired design	(Lombardi et al., 2004)	Language not English
(Judson and Munster, 2019)	No desired design	(Jung et al., 2017)	Language not English
(Klement et al., 2020)	No desired design	(Seungeun et al., 2018)	Language not English
(Li et al., 2020a)	No desired design	(June and 최은숙, 2016)	Language not English
(Maltezou and Tsiodras, 2014)	No desired design	(Jung et al., 2016)	Language not English
(Shaw, 2020)	No desired design	(Kim, 2015)	Language not English
(Styra et al., 2005)	No desired design	(Park and 김현진, 2017)	Language not English
(Ofner et al., 2003)	No desired design	(Jun, 2015)	Language not English
(Ahmed, 2017)	No desired design	(Karlberg, 2004)	Language not English
(Bartoszko et al., 2020)	No desired design	(Balkhy et al., 2016)	No desired population
(Belfroid et al., 2018)	No desired design	(Cao et al., 2020a)	No desired population
(Bowdle and Munoz-Price, 2020)	No desired design	(Karlberg et al., 2004)	No desired population
(Chan-Yeung and Xu, 2003)	No desired design	(Khalid et al., 2016a)	No desired population
(Chan-Yeung et al., 2003)	No desired design	(Khan et al., 2020)	No desired population
(Chen and Huang, 2020)	No desired design	(Lam et al., 2009)	No desired population
(Driggin et al., 2020)	No desired design	(Mak et al., 2009)	No desired population
(Ehrlich et al., 2020)	No desired design	(Mak et al., 2010)	No desired population
(Esswein et al., 2004)	No desired design	(Tansey et al., 2007)	No desired population
(Feng et al., 2020)	No desired design	(Cheung and Au, 2011)	No desired population
(Ferioli et al., 2020)	No desired design	(Caputo et al., 2006)	No desired population
(Gamage et al., 2005)	No desired design	(Grace et al., 2004)	No desired population
(Gardner and Moallef, 2015)	No desired design	(Krumkamp et al., 2009)	No desired population
(Gee and Skovdal, 2018)	No desired design	(Shen et al., 2020)	No desired population
(Greenberg et al., 2020)	No desired design	(Xiang et al., 2020)	No desired population
(Hassan et al., 2020)	No desired design	(Wang et al., 2020a)	No desired population
(Hawryluck et al., 2005)	No desired design	(Wang et al., 2020c)	No desired population
(Heakyung et al., 2018)	No desired design	(Christian et al., 2004)	No outcome of interest
(Hu and Kreutzer, 2010)	No desired design	(Chua et al., 2004b)	No outcome of interest
(Hui et al., 2018)	No desired design	(Elston, 2020)	No outcome of interest
(Hull, 2005)	No desired design	(Farrow, 2003)	No outcome of interest
(Jefferson et al., 2010)	No desired design	(Feng Tan, 2020)	No outcome of interest
(Jin et al., 2020)	No desired design	(Harvey, 2020)	No outcome of interest
(Johnstone and Turale, 2014)	No desired design	(Hassoun et al., 2015)	No outcome of interest
(Kawana, 2005)	No desired design	(Her, 2020)	No outcome of interest
(Khai et al., 2012)	No desired design	(Hero, 2020)	No outcome of interest

(Khan et al., 2018)	No desired design	(Heung et al., 2005)	No outcome of interest
(Koh, 2020)	No desired design	(Holden, 2003)	No outcome of interest
(Koh et al., 2005b)	No desired design	(Hsin and Macer, 2004)	No outcome of interest
(Koh et al., 2011)	No desired design	(Hsu et al., 2006)	No outcome of interest
(Koley, 2003)	No desired design	(Huang et al., 2020b)	No outcome of interest
(Lateef et al., 2004)	No desired design	(Huang et al., 2020c)	No outcome of interest
(Lima et al., 2020)	No desired design	(Iacobucci, 2020)	No outcome of interest
(Low and Wilder-Smith, 2005)	No desired design	(Imai et al., 2006)	No outcome of interest
(Maunder et al., 2010b)	No desired design	(Imai et al., 2005)	No outcome of interest
(Mitchell et al., 2013)	No desired design	(Joob and Wiwanitkit, 2020)	No outcome of interest
(Newman, 2020)	No desired design	(Kang et al., 2020a)	No outcome of interest
(Ng et al., 2020)	No desired design	(Koh et al., 2003)	No outcome of interest
(Otter et al., 2016)	No desired design	(Lai et al., 2020b)	No outcome of interest
(Rahman, 2018)	No desired design	(Lan et al., 2020)	No outcome of interest
(Rockwell and Gilroy, 2020)	No desired design	(Lau et al., 2004)	No outcome of interest
(Romano et al., 2020)	No desired design	(Leung et al., 2004b)	No outcome of interest
(Sarpy et al., 2005)	No desired design	(Loh et al., 2004)	No outcome of interest
(Semple and Cherrie, 2020)	No desired design	(Lu et al., 2020a)	No outcome of interest
(Sepkowitz and Eisenberg, 2005)	No desired design	(MacIntyre et al., 2015)	No outcome of interest
(Shaw, 2006)	No desired design	(MacIntyre et al., 2011)	No outcome of interest
(Sim and Chua, 2004)	No desired design	(Maunder et al., 2008)	No outcome of interest
(Suwantarat and Apisarnthanarak, 2015)	No desired design	(Memish et al., 2015)	No outcome of interest
(Tan et al., 2005)	No desired design	(Misra, 2020)	No outcome of interest
(Lancet, 2020)	No desired design	(Moore et al., 2005a)	No outcome of interest
(Tien et al., 2005)	No desired design	(Shanafelt et al., 2020)	No outcome of interest
(Torales et al., 2020)	No desired design	(Sim, 2020)	No outcome of interest
(Tysome and Bhutta, 2020)	No desired design	(Tan, 2004)	No outcome of interest
(Wu et al., 2020a)	No desired design	(Ekberg et al., 2009)	No outcome of interest
(Wu et al., 2020b)	No desired design	(Hugonnet and Pittet, 2004)	No outcome of interest
(Yassi et al., 2005)	No desired design	(Alraddadi et al., 2016a)	No outcome of interest
(Yiwen et al., 2010)	No desired design	(Amer et al., 2018)	No outcome of interest
(Yoon et al., 2016)	No desired design	(Chan et al., 2004)	No outcome of interest
(Zhu et al., 2004)	No desired design	(Chen et al., 2009)	No outcome of interest
(Maunder, 2009)	No desired design	(Chen et al., 2004)	No outcome of interest
(Fletcher, 2003)	No desired design	(Chow et al., 2004)	No outcome of interest
(Freeman, 2020)	No desired design	(Deng et al., 2006)	No outcome of interest
(Ling et al., 2020)	No desired design	(Jiang et al., 2017)	No outcome of interest
(Maunder, 2003)	No desired design	(Jiang et al., 2018)	No outcome of interest

(Pagliano et al., 2020)	No desired design	(Kang et al., 2018b)	No outcome of interest
(Unadkat and Farquhar, 2020)	No desired design	(Kim et al., 2017)	No outcome of interest
(Wang et al., 2020b)	No desired design	(Leung et al., 2004a)	No outcome of interest
(Wong, 2003)	No desired design	(Lim et al., 2013)	No outcome of interest
(Hsieh, 2003)	No desired design	(Liu et al., 2016)	No outcome of interest
(Shalhoub et al., 2016)	No desired design	(Maunder et al., 2010a)	No outcome of interest
(Al-Gethamy et al., 2015)	No desired design	(Moore et al., 2005b)	No outcome of interest
(Moniri et al., 2015)	No desired design	(Park et al., 2004)	No outcome of interest
(Nam et al., 2017)	No desired design	(Pena et al., 2009)	No outcome of interest
(Du et al., 2003)	Language not English	(Quinlan et al., 2003)	No outcome of interest
(He et al., 2003)	Language not English	(Qureshi et al., 2005)	No outcome of interest
(Hua et al., 2004)	Language not English	(Saibene et al., 2020)	No outcome of interest
(Huang et al., 2020a)	Language not English	(Shen et al., 2004b)	No outcome of interest
(Huang et al., 2004)	Language not English	(Sin, 2020)	No outcome of interest
(Jiang et al., 2003)	Language not English	(Tam et al., 2008)	No outcome of interest
(Li et al., 2004)	Language not English	(Teleman et al., 2004)	No outcome of interest
(Li et al., 2003)	Language not English	(Tham, 2004)	No outcome of interest
(Li et al., 2020c)	Language not English	(Turnberg et al., 2009)	No outcome of interest
(Liu et al., 2020b)	Language not English	(Wax et al., 2004)	No outcome of interest
(Liu et al., 2003)	Language not English	(Yan et al., 2020)	No outcome of interest
(Lu et al., 2010)	Language not English	(Lim et al., 2006)	No outcome of interest
(Ma et al., 2004)	Language not English	(Williamson et al., 2020)	No outcome of interest
(Meng et al., 2003)	Language not English	(Wise, 2020)	No outcome of interest
(Shen et al., 2004a)	Language not English	(Belingheri et al., 2020)	No outcome of interest
(Shen et al., 2006)	Language not English	(Alfaraj et al., 2018)	No outcome of interest
(Wang et al., 2004)	Language not English	(Casanova et al., 2008)	No outcome of interest
(Wu et al., 2003)	Language not English	(Chen et al., 2020)	No outcome of interest
(Xiao et al., 2003)	Language not English	(Hornbeck et al., 2012)	No outcome of interest
(Zhou et al., 2003)	Language not English	(Kissoon, 2003)	No outcome of interest
(Zou et al., 2004)	Language not English	(Petzold et al., 2020)	No outcome of interest
(권미형 and 진영란, 2018)	Language not English		

eTable IV: Main characteristics of the included studies of the impact of SARS on HCW

Study	Country	HCW involved	Sample size	Age: mean ±SD	Sex (% female)	MMAT	Key findings
(Avendano et al., 2003)	Canada	Multi-professional	14	42±9	78.6	1/5	Most HCW expressed feelings of fear, depression and anxiety at the time of the acute illness.
(Bai et al., 2004)	Taiwan	Multi-professional	218	36.9±8.9	66	3/5	5% of HCW during the SARS outbreak met criteria for an acute stress disorder. Anxiety (17%), insomnia (14%), and stigmatization feelings (20%) appeared. 15% did not go home after work during the outbreak for fear of infecting their family.
(Chan and Huak, 2004)	Singapore	Multi-professional	661	N.a.	N.a.	3/5	Physicians (OR=1.6, 95% CI=1.1-2.5) and single HCW (OR=1.4, 95% CI=1.0-2.0) were at higher risk of experiencing psychiatric symptoms compared to nurses and HCW who were married. Approximately 20% of the participants suffered from PTSD.
(Chan et al., 2005)	Hong Kong	Nurses	1470	N.a.	91.7	3/5	62.9% of nurses with high-risk level of contact with SARS patients, considered their general health to be good in the week before the outbreak. During the outbreak, nurses suffered different physical symptoms, most frequently headaches (46.2%), back pain (34%), and sore throat (25%). 69.8% perceived stress. However, 59.1% felt they were able to cope with it.
(Chang et al., 2004)	Taiwan	Multi-professional	193	32.7±8.2	72	3/5	Of 193 emergency department HCW exposed to SARS, 4.7% were infected; 3.1% had pneumonia. Incidence was higher in ambulance drivers (16.7%) and sanitation workers (15.4%) than in nurses (3.2%).
(Chen et al., 2005)	Taiwan	Multi-professional	128	26.5±3.1	100	3.5/5	11% nurses had stress reaction syndrome. This rate was higher (17%) in the high-risk group (including nurses who worked on emergency units, intensive care units, and general medical ward). This high-risk group had more posttraumatic stress symptoms and reactions, as well as avoidance behaviours and depression ($p<0.05$).
(Chen et al., 2006)	Taiwan	Multi-professional	116	31±10.8	98.3	3/5	Family support ($p=0.003$) was associated with lower anxiety levels ($p=0.003$) and depression ($p=0.003$) in nursing staff during the outbreak. Volunteers had lower anxiety levels ($p<0.001$). The SARS prevention program improved anxiety ($p<0.001$), depression ($p<0.0001$), and sleep quality ($p=0.0008$).
(Chen et al., 2007)	Taiwan	Multi-professional	90	28.2±5.1	N.a.	4/5	HCW had poorer scores than the control group in 6 health dimensions: role physical ($p<0.01$); bodily pain ($p<0.05$); vitality ($p<0.01$); role emotional ($p<0.05$); social functioning ($p<0.001$); and mental health ($p<0.05$).
(Chiu et al., 2004)	Taiwan	Nurses	16	29.9	68.7	3/5	Clinical symptoms on admission of HCW included fever (100%), chills (50%), myalgia (50%), cough (31%), sore throat (44%), and diarrhoea (13%). Leukopenia was detected in 38%, severe lymphopenia in 75%, anaemia 19% and thrombocytopenia in 38%. The average duration of hospital stay was 18±9 days. The mortality rate was 6.2%
(Chong et al., 2004)	Taiwan	Multi-professional	1257	31.8±6.4	81.1	3.5/5	The average Impact of Event Scale -IES-, a measure of intrusive and avoidant phenomena in response to a specific stressful life event, in HCW was

							34.8±19.7. This was higher in men, technicians, HCW with less than 2 years of work experience, HCW exposed to SARS and HCW not living with their family. Prevalence of psychiatric morbidity was 75.3%, higher in the repair phase (80.6%) than in the initial phase (71.3%). 77.4% of respondents reported anxiety and worrying, 74.2% depression and poor family relationships, 69% somatic symptoms and 52.3% sleep problems.
(Chua et al., 2004a)	Hong Kong	Multi-professional	271	N.a.	75	3.5/5	Stress levels in the outbreak were elevated for HCW and controls. 89% of HCW experienced tiredness (71%), worry about health (59%), and fearing social contact (46%). HCW who were confident about infection control had lower stress levels (p=0.001).
(Foo et al., 2006)	Singapore	Multi-professional	322	32.4	85.7	4.5/5	35.5% HCW that used masks regularly reported adverse skin reactions: 59.6% of them reported acne, 51.4% facial itch, 35.8% rash, 7.3% pigmentation and 3.7% scar at nose bridge (related to the use of N95 masks for 8 hours per day for over 8.4 months). 13.8% sought treatment from a physician. 21.4% HCW reported adverse skin reactions after using gloves: 73.4% reported dry skin, 56.3% itch, 37.5% rash and 6.3% wheals. Only 1.6% HCW that used regularly gowns reported adverse skin reactions.
(Gearing et al., 2007)	Canada	Social workers	21	39.6	N.a.	4/5	Q: Social workers practising in hospital were assigned to three focus groups. They disclosed the impact of SARS and the control procedures in their personal and professional life. They felt that they had to handle discrepancies in information, surpass barriers to communication, and find creative solutions for patients during the epidemic period.
(Gomersall et al., 2006)	Hong Kong	Multi-professional	187	47[a]	N.a.	4/5	After the implementation of infection control measures designed to prevent transmission of SARS among ICU staff, the incidence was 2.7%.
(Grace et al., 2005)	Canada	Physicians	193	48.2±11.0	32.1	4/5	23.3% HCW who answered the survey provided direct care to SARS patients. Higher rate of psychological distress was seen among physicians providing direct care to SARS patients (45.7%) than among those that did not provide direct care to SARS patients (17.7%), p<0.001. Physicians providing direct care to SARS patients rated that they felt more stigmatized than physicians not providing such care (p=0.004).
(Ho et al., 2003)	Hong Kong	Multi-professional	40	36	77.5	4/5	The average time between symptom onset and hospitalization was 2.7 days in 40 HCW infected with SARS-associated coronavirus. Cumulative incidence of infection was 8% for care assistants, 5% for physicians and 4% for nurses. 87.5% were infected from direct patient contact, while 5% were infected from contact with co-workers.
(Ho et al., 2004)	Singapore	Multi-professional	372	34±9	77.2	3/5	5.6% HCW were hospitalized, and 1.6% were classified by clinical criteria as probably infected by SARS. 16.9% HCW reported fever, 18.5% reported cough and 5.9% reported diarrhoea.
(Ho et al., 2005)	Hong Kong	Multi-professional	179	N.a.	70.4	3/5	HCW evaluated at the peak of the SARS outbreak, and HCW recovered from SARS, had both of them more fear of infecting others than fear of being infected themselves (p=0.001). HCW with lower self-efficacy ("sense of

							control over avoiding infection") tended to have higher fear related to SARS (p<0.05).
(Ho et al., 2006)	Taiwan	Multi-professional	230	32±8	91.6	4.5/5	1% HCW developed clinical SARS disease. From those HCW with a positive RT-PCR, but without the full-blown disease, 24.0% presented with mild symptoms, including 8% mild fever, 20% cough, and 4% diarrhoea.
(Ip et al., 2004)	China	Multi-professional	323	36.2	79	2/5	Rates for clinical SARS infection in HCW on SARS medical wards was 7.1%. This rate was particularly high among nurses (11.6%) and health care assistants (11.8%).
(Koh et al., 2005a)	Singapore	Multi-professional	10511	36.6±11.3	82	4/5	66% HCW felt at great risk of exposure to SARS. 76% were afraid of getting ill or dying for contracting SARS. 82% of HCW were concerned about inadvertently spreading the disease to their families, friends, and colleagues. 82% felt appreciated by their hospital, clinic or employer and 77% felt appreciated by society. 56% reported feeling more stressed at work, and 53% experienced an increase in their workload. 54% had to perform work that they usually would not do, and 36% had to work overtime.
(Lancee et al., 2008)	Canada	Multi-professional	139	45.0±9.6	87	3/5	18 months (median) since the last SARS patient was discharged, new episodes of psychiatric disorders occurred in 5% HCW in that period of time. These episodes were inversely associated with the number of years of health care experience (p=0.03) and the perceived adequacy of training and support (p=0.03). In the time since the SARS outbreak, 19% experienced panic attacks.
(Lau et al., 2005)	Hong Kong	Multi-professional	1063	N.a.	78	2/5	No HCW who took herbal supplements contracted SARS versus 0.4% HCW in the control group (p=0.014). Less than 2% of HCW reported minor adverse events. There was a statistically significant improvement in mental health and vitality (p=0.01) between day 0 and day 28 (p<0.001) among HCW who took herbal supplements
(Law et al., 2008)	China	Multi-professional	13	35.5	84.6	3/5	In 13 HCW with history of SARS complicated with avascular necrosis, there were 36 joints affected (i.e. more than one joint was affected in several HCW); in 47.2% HCW the hips were affected, in 44.4% the knees and in 8.3% the shoulders. 69.2% HCW complained of multiple areas of pain. 92.3% could only reach limited physical demands.
(Lee et al., 2005)	Taiwan	Multi-professional	26	29.6±4.3	100	2/5	Nurses reported experiencing a mixture of various negative feelings, including anxiety, fear, depression and loss of control. Most nurses suffered from stresses related to worries about colleagues (92%), patients (89%) and family members (89%). 77% reported the tragic death of the head nurse as a major stressor for them. 100% considered psychiatric services effective in helping them manage their stress. Encouragement among peers (100%), enough rest and time off (96%) and appropriate work shifts (96%) were all helpful in reducing their stress and restoring their energy.
(Lee et al., 2007)	Hong Kong	Multi-professional	63	N.a.	85.7	3/5	HCW were more distressed on all dimensions of psychological distress than non-HCW. They had significantly higher depression scores (p<0.01), and higher anxiety scores compared with non-HCW (p=0.001). Posttraumatic stress symptoms were also higher on intrusion (p<0.001), avoidance (p<0.05), and

							hyperarousal (p< 0.05). HCW (90.3%) scored more than non-HCW (49.1%), p<0.001, for minor psychiatric disorders.
(Lim et al., 2005)	Singapore	Multi-professional	212	31	77.8	2/5	37.3% of HCW reported headaches when they wore facemask. Of those, 32.9% reported headaches' frequency exceeding six times per month. 7.6% needed to take sick leave, and 59.5% need abortive analgesics.12.1% took preventive medications. Pre-existent headaches were associated (OR=2.0, 95% CI=1.03-3.8) with the development of headaches.
(Lin et al., 2007)	Taiwan	Multi-professional	92	33.8±0.7	91.3	4.5/5	93.5% HCW considered the SARS outbreak to be a traumatic experience. 4.3% considered SARS a "very serious" stress in their life, 41.3% a "serious" stress and 47.8% a "mild" stress. 19.3% scored as highly suspected on the trauma scale. Minor psychiatric morbidity was 47.8%.
(Liu et al., 2009)	China	Multi-professional	477	31.2±8.9	68.5	3/5	10.7% HCW in the sample were infected. Performing chest compression (p=0.02) or intubation (p<0.001), having contact with respiratory secretions or sputum (p=0.004), and emergency care experience (p=0.001) appeared as risk factors of infection. Wearing 16-layer cotton surgical mask (p<0.001), wearing multiple layers of masks (p=0.002), taking prophylactic medicine (p=0.002), taking training (p<0.001), and nose washing (p<0.001) were protective against infection.
(Liu et al., 2012)	China	Multi-professional	549	N.a.	76.5	5/5	77.2% HCW had low levels of depressive symptoms,14% had moderate levels of depressive symptoms, and 8.8% had high levels of depressive symptoms. Being single (p<0.001), having been quarantined during the outbreak (p<0.001), having been exposed to other traumatic events before SARS (p<0.001), and perceived SARS-related risk level during the outbreak (p<0.001) were found to increase the odds of having high levels of depressive symptoms 3 years later.
(Lu et al., 2006)	Taiwan	Multi-professional	127	32.3±7	58.3	4/5	17.3% HCW developed significant mental symptoms. No differences were found between physicians, nurses and other professionals. Maternal care (p=0.011) had a positive influence on mental health, while neuroticism (p<0.001) had a negative influence on mental symptoms.
(Lung et al., 2009)	Taiwan	Multi-professional	123[b]	32.3±7[b]	58.3	4/5	15.4% of HCW showed mental symptoms over follow-up and 30.9% reported feelings of pressure from their life or job. Lower education level (p=0.039), the experience of daily-life stressful events (p=0.001), and higher neuroticism (p<0.001) resulted in poorer mental health after one year.
(Marjanovic et al., 2007)	Canada	Nurses	333	43.8±10	95	4/5	Lower levels of vigour (β=0.27, p<0.001), less support from the organization (β=0.26, p<0.001) and more time spent in quarantine (β=0.23 p<0.001) predicted higher levels of avoidance behaviour; Lower levels of vigour (β=0.34, p<0.001), lower levels of trust in the organization (β=0.15, p=0.005) and more contact with SARS patients (β=0.15 p=0.003) predicted higher levels of emotional exhaustion; Lower levels of vigour (β=0.20, p<0.001), less support from the organization (β=0.24, p<0.001), lower levels of trust in the organization (β=0.14, p=0.011) and more time spent in quarantine (β=0.14 p=0.008) predicted higher levels of of state anger.

(Maunder et al., 2003)	Canada	Multi-professional	11	N.a.	N.a.	4/5	Q: Staff were adversely affected by fear of contagion and of infecting their families, friends and colleagues. The perception of personal danger was exacerbated by uncertainty. The perception of personal danger was heightened by the known lethality of the syndrome and intense media coverage of the outbreak and its effects.
(Maunder, 2004)	Canada	Multi-professional	1557	40.2±11	74.6	3/5	Intrusion, avoidance and traumatic stress appeared in HCW. Direct care of SARS patients, being a nurse, having children, experiencing job stress, experiencing social rejection, coping through avoidance of crowds and colleagues, and attachment insecurity were significantly associated with the severity of stress response.
(Maunder et al., 2004)	Canada	Multi-professional	1557	40.2±11	74.6	3/5	Higher traumatic stress scores were found in nurses and HCW with contact with patients with SARS ($p<0.001$). Health fear, social isolation and avoidance, job stress and dissatisfaction with system and process were also higher in nurses and HCW in contact with patients ($p<0.001$)
(Maunder et al., 2006)	Canada	Multi-professional	769	44.1±9.4	86.9	4/5	13 to 26 months after the SARS outbreak, 27.7% HCW experienced high burnout, 41.4% high psychological distress and 12.5% high posttraumatic stress. Adequacy of training and support was protective, while maladaptive coping style and attachment anxiety were provocative.
(McAlonan et al., 2007)	China	Multi-professional	184	N.a.	64.1	4/5	1 year after the SARS outbreak, perceived stress levels were still significantly higher among high-risk HCW who worked in SARS isolation units compared to low-risk control subjects who worked in psychiatry inpatients units. Higher scores in depression and anxiety were found in high-risk HCW compared with low-risk HCW working in other unit ($p<0.05$). Perceived stress was associated with higher levels of depression, anxiety, and general psychological distress.
(Moldofsky and Patcai, 2011)	Canada	Multi-professional	21	46.3±11.0	86.4	2/5	HCW infected by SARS reported more physical symptoms than healthy controls ($p<0.0001$). They complained of tiredness, difficulty sleeping, myalgia and muscular weakness. They had mild to moderate depressive symptoms and sleep disturbances. They had more fatigue post-sleep ($p<0.05$), and more myalgia pre- and post-sleep ($p<0.01$) than non-infected subjects. Sleep fatigue and post-sleep sleepiness were similar to patients with fibromyalgia syndrome and chronic fatigue syndrome ($p>0.05$).
(Nickell et al., 2004)	Canada	Multi-professional	1983	N.a.	78.8	3/5	64.7% HCW were concerned about their own health and 62.7% about their family´s health during the SARS outbreak. 29% scored above the threshold of probable emotional distress. Being a nurse (OR=2.8, 95% CI=1.5-5.5), part-time employment (OR=2.6, 95% CI=1.2-5.4), lifestyle affected by the SARS outbreak (OR=2.2, 95% CI=1.4-3.5) and job affection by the precautionary measures (OR=2.9, 95% CI=1.9-4.6) were associated with the presence of emotional distress.
(Ofner-Agostini et al., 2006)	Canada	Multi-professional	17	39.2±2.3	76.5	2/5	In this cohort of HCW with severe SARS, 60% reported 1-3 comorbidities, including asthma (27%), diabetes (13%), current smoking (13%), cardiac problems (7%), and immune-related problems (7%). 41% were involved in at least one intubation involving a patient with SARS. 18% were splashed in their

							face with fluid from a patient with SARS. HCW reported fatigue because of the numbers and lengths of their shifts and the time required for the use of personal protective equipment.
(Poon et al., 2004)	China	Multi-professional	1926	N.a.	N.a.	4/5	Anxiety scores were significant in HCW. They were higher in staff with a previous contact with patients with SARS than in those who did not have it ($p<0.01$). Mean anxiety levels were higher among workmen, health care assistants, and nurses than among administrative staff controls or physicians ($p<0.01$).
(Pratt et al., 2009)	Canada	Nurses	536	48.4±7.5	96.6	3.5/5	Half of the nurses reported experiencing moderate to high levels of burnout. Effort-Reward Imbalance predicted burnout ($p<0.001$).
(Puro et al., 2006)	Italy	Multi-professional	2035	N.a.	N.a.	3.5/5	13.1% HCW took a leave of absence >7 days over a 1-year period during SARS alert.
(Rambaldini et al., 2005)	Canada	Physicians	17	N.a.	N.a.	5/5	Q: Medical residents were concerned about the potential risk of acquiring SARS and the risk they posed to their loved ones. Anxiety was exacerbated by inconsistency in the information available. 52.9% were clearly apprehensive of caring for SARS patients. 23.5% expressed concerns about the strained professional behaviour that they witnessed. 58.8% believed that SARS compromised their education.
(Reynolds et al., 2006)	Vietnam	Multi-professional	193	N.a.	N.a.	2/5	Attack rate in HCW was 18.7%. This was highest in nurses who worked in the outpatient clinics (57.1%) and nurses that worked in in the inpatient general wards (47.4%). Fever and fatigue appeared in over 80%[c] HCW. Myalgia, chills and anorexia in over 70%[c] infected HCW, and in around 55%[c] SARS infected.
(Reynolds et al., 2008)	Canada	Multi-professional	269	41.6±10.2	84	3/5	Symptoms of post-traumatic stress disorder were more frequent in HCW (22.4%) than in non-HCW (11.8%), $p<0.001$. 41.6% HCW experienced anger, 59.1% annoyance, 33.5% fear, 73.2% frustration, 16.4% guilt, 2.6% happiness, 38.3% helplessness, 72.9% isolation, 53.5% loneliness, 24.2% nervousness, 26.0% sadness and 54.0% worries.
(Robertson et al., 2004)	Canada	Multi-professional	10	43.1±9.1	60	4/5	Q: 50% of HCW were quarantined at home and 50% at work. HCW expressed a wide range of emotions including fear, lack of control, anger, and frustration. They also experienced stigma. They declared to be dedicated to their profession and to their duty to care for the patients.
(Shih et al., 2007)	Taiwan	Nurses	200	27.6±4.5	96	3/5	Q: 100% HCW reported being anxious about their safety and the safety of their families, clients, and colleagues. 70% of the nurses strived to develop alternative ways of protecting themselves. 70% experienced self-doubt and external pressure to make a sacrifice. 60% complained about a lack of adequate time to prepare themselves. 90% reported emotional distress caused by the devaluation of nursing care.
(Shih et al., 2009)	Taiwan	Nurses	70	27.6±4.5	92.9	3/5	Q: The study evaluating nurses working under stress during SARS epidemic detected five stages in over 12 weeks: "facing shock and chaos" in weeks 1-4; "searching for reliable sources to clarify myths" in weeks 1-8 in week 1-8; "developing and adjusting nursing care" in weeks 1-8; "supporting nurses and their clients" in weeks 1-12; and "rewarding nurses" in weeks 8-12.

(Styra et al., 2008)	Canada	Multi-professional	248	36.9±9.2	86	3/5	42% of HCW did not feel appreciated by society at large for the nature of their work. Working in a high-risk unit, attending only one SARS patients, perception of personal risk, impact on work-life, and depressive affect contributed to the presence of posttraumatic stress symptomatology. Avoidance in HCW was associated with greater impact on personal life (p=0.006), work-life (p=0.003), and depressive affect (p<0.001). Intrusive symptoms were associated with the perception of one's own risk (p<0.001), impact on work-life (p<0.001), and depressive affect (p<0.001).
(Su et al., 2007b)	Taiwan	Nurses	102	25.4±3.7	100	4.5/5	Prevalence of symptomatic depression was 27.5% in HCW. The rate was higher in the SARS (38.6%) than in non-SARS units (3.2%), p<0.001. Rates of symptomatic PTSD were 28.4% and particularly high in SARS ICU (38.5%). Insomnia (for over two weeks) was 28.4%, particularly high in SARS regular unit (43.2%).
(Su et al., 2007a)	Taiwan	Multi-professional	13	31.4±4.8	76.9	3/5	14 months after being discharged from the hospital because of SARS infection, 92.3% HCW had FVC and FEV within normal ranges. 7.7% had a mild restrictive abnormality, and 61.5% had decreased carbon monoxide diffusing capacity levels.
(Sun et al., 2003)	Taiwan	Multi-professional	17	38.5±10.3	17.6	2/5	17 HCW (12 probable SARS, 5 suspected SARS) received a loading dose of 2000 mg ribavirin, followed by 1000-1200 mg ribavirin per day for 10 days. For patients who developed pneumonia, methylprednisolone iv was started on day 8 of fever or later. Upon improvement, the dose of steroid was tapered off over the next 2 weeks as recovery warranted. PCR proved positive in 41.2% HCW, and convalescent serum antibodies were positive in 76.5% HCW. 5.9% needed subsequent intubation and respiratory support. 100% recovered without major sequelae or subsequent relapse.
(Tam et al., 2004)	Hong Kong	Multi-professional	641	34.1±8.3	79	3/5	68% of HCW reported 'significant' or 'severe' levels of job-related stress during the outbreak. Female gender (OR=1.8, 95%C=1.3-2.5), poor self-rated physical health (OR=5.7, 95% CI=1.7-19.2), high level of job-related stress (OR=4.1, 95% CI=2.3-7.2) and inadequate counselling and psychological support from employer (OR=0.5, 95% CI=0.3-0.9), and inadequate insurance and compensation (OR=0.5, 95% CI=0.3-0.9) were significant predictors of psychological morbidity.
(Tham et al., 2004)	Singapore	Multi-professional	96	31.9±7.7	68.8	2/5	17.7% HCW suffered post-event morbidity in relation to the SARS outbreak: 13.2% were physicians and 20.7% nurses. 18.8% HCW suffered psychiatric morbidity: 15.8% physicians and 20.7% nurses.
(Tolomiczenko et al., 2005)	Canada	Multi-professional	300	42.6±12.3	73.9	2/5	All HCW groups, including nurses, physicians, managers and emergency room/ intensive care unit workers, found SARS stressful. Nurses reported a greater impact on morale and job satisfaction than other professionals (p<0.05). Nurses relied more on peer support than physicians (p<0.05). They also felt less informed (p<0.01) and less involved (p<0.05) in decision-making than physicians felt.

(Verma et al., 2004)	Singapore	Physicians	1050[d]	46.6±10.8	39.5	4/5	14.1% of general practitioners (GP) had significant psychological distress. Those GPs with significant psychological distress were younger (p=0.01) and had higher scores in post-traumatic stress and stigma (p<0.001). GPs involved in the direct care of patients with SARS were more likely to be distressed (OR=2.9, 95% CI=1.3-6.3). GPs involved in the direct care of patients with SARS had higher post-traumatic stress disorder scores.
(Wilder-Smith et al., 2005)	Singapore	Multi-professional	80	28[a]	91	4/5	Of 80 HCW who had been exposed to patients with SARS, 56% were positive by SARS serology. Of those, 82% were classified as having pneumonic SARS (defined as having a positive serology result, fever, respiratory symptoms, and radiologic changes consistent with pneumonia), 4% as having subclinical SARS and 13% as being asymptomatic. HCW with asymptomatic SARS were more likely to have used masks (50%) than HCW that developed pneumonic SARS (8%) (p=0.025).
(Wong et al., 2005)	Hong Kong	Multi-professional	458	N.a.	65.7	3/5	Distress level in HCW was 6.2/10: 5.9/10 for physicians, 6.5/10 for nurses and 5.4/10 in healthcare assistants, being differences statistically significant between nurses and healthcare assistants (p<0.005). 2.2% were infected. The overall distress level was highly and significantly correlated with the six sources of distress: vulnerability/loss of control (r2 = 0.68); health of self (r2 = 0.62); spread of virus (r2 = 0.60); health of family and others (r2 = 0.59); changes in work (r2 = 0.46); being isolated (r2 = 0.45). The scores for nurses were significantly higher than for physicians in terms of the six sources of distress (all p<0.01).
(Wong et al., 2004a)	Hong Kong	Multi-professional	215	N.a.	64	3/5	Perceived stress scores were significant in healthcare students. Medical students had lower stress than nursing students p<0.001. They also had lower stress levels than non-healthcare students (p<0.05).
(Wong et al., 2004b)	Hong Kong	Medical students	66	23.0	53.1	3/5	24% students who visited the index patient's ward acquired SARS. The median incubation period was 3 days (range 2–6 days). Those that visited the index patient´s cubicle had a higher relative risk of infection (RR=7.4, 95% CI=1.0-53.3). The students with SARS suffered fever (100%), chills or rigors (94%), headache (75%), anorexia (68.8%), myalgia (62.5%), dizziness (37.5%), cough (37.5%) and shortness of breath (33%). 6.2% required mechanical ventilation and treatment in the ICU. 100% recovered from the illness.
(Wong et al., 2004c)	Hong Kong	Physicians	137	44.4±9.4	17.6	3/5	61.3% of GPs had suspected or probable SARS. Significant anxiety was found in primary care physicians when dealing with SARS, being GPs who were exposed to SARS or GPs who had worked in high infection districts less likely to quarantine themselves (p<0.01). Most GPs said that SARS had changed their clinical practice. Around 75% requested more medical investigations.
(Wu et al., 2008)	China	Multi-professional	549	N.a.	76.5	4.5/5	69% of HCW used alcohol in the last year before the study. 19% HCW had at least one alcohol-related symptom, while < 5% had two or more symptoms. Being quarantined (OR=1.6, 95% CI=1.0-2.6), working in locations where exposure to SARS patients was common (OR=1.7, 95% CI=1.1-2.6), and PTSD

							symptoms (OR=2.3, 95% CI=1.4-3.9), were significantly associated with later alcohol abuse/dependence symptoms.
(Wu et al., 2009)	China	Multi-professional	549	N.a.	76.5	5/5	10% of HCW had high levels of posttraumatic stress symptoms in the three years after exposure to the SARS outbreak. Those under 50 years of age more likely to have a high symptom level (≤35 years p=0.01, 36-50 years p=0.02). HCW who had quarantined, worked in high-risk locations or had friends or close relatives who contracted SARS, were more likely to have high posttraumatic stress symptom levels (all p<0.001). 40% of HCW with high levels of posttraumatic stress symptoms during the 3-year period still had high posttraumatic stress symptoms at the interview. Persistent symptoms were associated with being single (OR=11.9, 95% CI=2.5-56.7), and with low household income (OR= 4.2, 95% CI=1.3-13-5).

[a]Data corresponds to median age; [b]Data from 127 HCW recruited at baseline; [c] Data not exact, estimated from the graph; [d] Included general practitioners and Chinese medicine practitioners

FEV: forced vital capacity; FVC: forced expiratory volume; GP: general practitioner; HCW: healthcare workers; ICU: intensive care unit; MMAT: Mixed Methods Appraisal Tool; N.a: not available; PCR: Polymerase Chain Reaction; PTSD: post-traumatic stress disorder; Q: qualitative study; RT-PCR: Reverse Transcription- Polymerase Chain Reaction; SARS: Severe Acute Respiratory Syndrome.

eTable V: Main characteristics of the included studies of the impact of MERS on HCW

Study	Country	HCW involved	Sample size	Age: mean ±SD	Sex (% female)	MMAT	Key findings
(Abolfotouh et al., 2017)	Saudi Arabia	Multi-professional	1031	37.1±9	70.5	4.5/5	70.4% HCW felt they were at risk of being infected by MERS at work, 69.1% felt threatened if a colleague was infected, 87.8% did not feel safe at work.
(Al Ghobain et al., 2017)	Saudi Arabia	Physicians	27	27	35	3/5	91.5% of residents thought their work was putting them at risk of infection, but 65% thought this risk was part of their job. 54% were afraid of contracting the infection, but only 4.2% were willing to change their job. Residents thought their job would expose their families (85%), parents (83%), and friends (77%) and put them at risk. 48% were afraid of telling their families about the risk of exposure. 42% felts more stressed than usual at work. 57% had received infection control training. First-year residents were more afraid of being infected than residents from later years (p<0.003).
(Al-Tawfiq and Memish, 2019)	WHO database	Multi-professional	105	47.7±16.3	25.6	3.5/5	Comorbidities were more frequent in HCW (71%) than in non-HCW (1.9%), p<0.001. The fatality rate was lower in HCW (16%) than in non-HCW (34%), p=0.001.
(Aldrees et al., 2017)	Saudi Arabia	Physicians	228	26[a]	35.1	3/5	85.5% residents considered to be at risk, but 60% thought this risk was a part of their job. 15.4% thought, as residents, they should not be looking after MERS patients. 2.6% thought about changing their work because of the risk. 39% avoided telling their family about their risk. Acceptance of the risk as part of their job was more common in those that received personal protective equipment training (p=0.022). Married residents were more likely to agree that the risk they were exposed to was not acceptable (p=0.005). Residents with higher self-rated knowledge of MERS were more likely to feel that the job put them at risk (p=0.006), but also to accept the risk (p=0.003).
(Almutairi et al., 2018)	Saudi Arabia	Multi-professional	7	41.7±15.8	51.7	4/5	Q: Some participants expressed a high level of altruism associated with professionalism, while others did not. HCW suffered negative and painful experiences and perceived prejudice behaviours and stigmatization. They also experienced fear, despair, and anxiety. Denial and infra-estimation of the seriousness of the disease occurred, particularly at the beginning of the pandemic. They suffered from experiencing traumatic experiences, which affected their work performance.
(Alraddadi et al., 2016b)	Saudi Arabia	Multi-professional	283	37.3	64.4	4/5	For HCW working in units that treated MERS patients, the attack rate was 8%. Of those, 15% were asymptomatic, 60% had mild illness, 10% had moderate illness requiring hospital admission and 15% had severe illness requiring mechanical ventilation. 65% had muscle pain, 63.2% fever, 55% headache, 55% dry cough, 35% diarrhoea, 35% nausea, 35% shortness of breath, 31.6% runny nose, 30% chills, 25% sore throat, 20% vomiting, 16.7% productive cough and 5% rash.
(Alshukairi et al., 2016)	Saudi Arabia	Multi-professional	9	38	44.4	1/5	22.2% infected HCW had severe pneumonia, 33.3% had mild pneumonia, 11.1% had upper respiratory tract disease, and 33.3% remained asymptomatic.

(Alsubaie et al., 2019)	Saudi Arabia	Multi-professional	516	N.a.	52.1	1/5	HCW had significant anxiety. Non-physicians expressed higher levels of anxiety toward the risk of transmitting MERS to their families than physicians (p<0.001). Most frequently reported reasons for worry were the ability of the virus to cause severe disease or death (88%) and lack of specific treatment (80%)
(Bukhari et al., 2016)	Saudi Arabia	Multi-professional	386	35.5±9.8	86	4/5	26.9% HCW considered changing their leave to avoid contact with MERS patients. 7.8% HCW were extremely worried, 20.5% very worried and 32.4% somewhat worried about contracting MERS in previous weeks to the study; 12.2% had been extremely worried, 21% very worried and 29% somewhat worried over the last four weeks about transmitting MERS infection from hospital to their families. Those in contact with MERS were equally worried and afraid of transmitting MERS infection as those who not in close contact. Those in isolation areas, ICUs, and emergency rooms were more worried though than those in non-isolation areas (p=0.031).
(Elkholy et al., 2020)	WHO database	Multi-professional	415	39.3	54.9	4/5	Among all cases of MERS cases reported to WHO by June 2018, HCW were 18.6% of all cases and 34.2% of secondary cases. Later year of infection and having no comorbid conditions were protective factors for death in HCW with secondary infection. Secondary HCW were younger than non-HCW secondary cases (p< 0.001), more frequently female (p<0.001), non-national (p< 0.001), had asymptomatic infection (p<0.001), fewer comorbidities (p<0.001) and higher survival rates (p<0.001).
(Hall et al., 2014)	Saudi Arabia	Multi-professional	48	30.5	60	2/5	Respiratory symptoms were reported by 21% HCW with previous case-patient contact. Among these, symptoms included cough (40%), sore throat (30%), myalgia (30%), rhinorrhoea (20%), self-reported fever (10%), diarrhoea (10%), and sneezing (10%); 20% sought medical care and received a diagnosis of pharyngitis. However, the results of EIA testing of serum were 100% negative
(Hunter et al., 2016)	United Arab Emirates	Multi-professional	19	39[a]	42	4/5	Of HCW with laboratory MERS confirmation by PCR: 53% reported physical symptoms, 42% fever or symptom of respiratory illness, 32% fever, 26% muscle aches, 26% sore throat, 21% fatigue/malaise, 21% cough, 16% headache and 11% joint pain.
(Im et al., 2018)	Korea	Nurses	8	33.9	100	4/5	Q: Nurses in isolation felt hopeless and depressed, experienced shame, reported traumatic experiences when assisting terminal MERS patients, felt dizziness due to the protective clothing, while at the same time feeling pride for their contribution at work.
(Jung et al., 2020)	Korea	Multi-professional	147	N.a.	100	3/5	25.1% of nurses experienced full PTSD, and 32.0% experienced some level of PTSD. PTSD was positively associated with turnover intention, and supervisor support had a strong buffering effect. Their self-rated mental health was "problematic".
(Kang et al., 2018a)	Korea	Nurses	27	29.5±4.7	92.6	3/5	Q: 4 major themes emerged in a qualitative study of nurses participating in 7 focus group interviews including 3 individual interviews: burnout because of workload, experiences with personal protective equipment, difficulties catching up with new guidelines and caring for patients with MERS with caution.

							Overload of nurses' work during the outbreak led to burnout, and this affected negatively the quality of the care they provide to patients.
(Khalid et al., 2016b)	Saudi Arabia	Multi-professional	117	38.5±8	76	2/5	The main stressors for HCW were related to safety. Seeing colleagues with symptoms (92%) and being intubated (96%) were particularly distressing stressors. Caring for sick colleagues (88%) also put them under an enormous emotional burden. Following strict personal protective measures (99%) or keeping separate clothes for work (94%) improved stress in HCW.
(Kim et al., 2016a)	Korea	Multi-professional	737	33.0±8.5	78.3	2/5	Incidence of MERS infection in HCW in direct contact with confirmed MERS patients was 1.5%. 30% HCW with direct contact with MARS reported at least one symptom within 4 weeks of contact with PCR-confirmed MERS patient. Generalized symptoms (24%), including fever (11.1%), fatigue (11.1%) and myalgia (9.2%), were frequently reported. Respiratory symptoms were reported in 13.6% and gastrointestinal symptoms in 7.5% HCW.
(Kim and Choi, 2016)	Korea	Nurses	215	28.2±5.4	93.5	2/5	Burnout was higher in nurses who worked with a shift system that supposed more working hours and in nurses that worked with MERS infected or suspected patients ($p<0.05$). Burnout in HCW related to MERS was 3/ 5; job stress was 3.2/5, and fear of infection was 6.7/10.
(Kim et al., 2016b)	Korea	Multi-professional	9	N.a.	55.5	1/5	In 8 HCW out of 9 (88.9%) exposed to direct contact with SARS, no subclinical infection was detected. In 1/9 (11.1%), MERS was transmitted, and HCW suffered pneumonia.
(Kim, 2018)	Korea	Nurses	12	31.8±6.7	66.6	4/5	Q: Nurses felt a strong responsibility towards their job. They experienced fear and loneliness, decreased physical strength, extreme stress and stigma from society.
(Lee et al., 2018a)	Korea	Multi-professional	35	28	82.9	2/5	10.5% HCW visited the MERS screening clinic for MERS-like symptoms. The most common symptom was fever (68.6%), followed by cough (34.3%).
(Lee et al., 2018b)	Korea	Multi-professional	359	N.a.	81.9	2/5	During the hospital shutdown, 64.1% of HCW had PTSD-like symptoms and 51.5% PTSD diagnosis. The last was tested during a second survey a month after the shutdown: in 54.5% PTSD-like symptoms remained, and in 40.3% PTSD diagnosis.
(Memish et al., 2013)	Saudi Arabia	Multi-professional	7	42.7±8.3	100	2/5	RT-PCR identified 7 HCW. 28.6% were asymptomatic, and 71.4% had mild upper respiratory tract symptoms. 57.1% had a feverish feeling, but only 14.3% had measured fever. 28.6% had cough, 57.1% sore throat, 57.1% runny nose and 42.9% muscle aches.
(Park et al., 2018)	Korea	Nurses	187	31.1±6.7	100	3/5	Mental health nurses working at a hospital during the MERS epidemic suffered stress and stigma. The influences of stigma and hardiness on mental health were partially mediated through stress ($p<0.001$).
(Shalhoub et al., 2018)	Saudi Arabia	Multi-professional	32	39[a]	50	4/5	34% HCW admitted to ICU with MERS had comorbidities. 25% died including 100% of those with chronic renal impairment. HCW who had lower PaO2/FiO2 ratios ($p=0.043$) and received more ECMO therapy than survivors ($p=0.02$).15% HCW who survived confirmed functional limitations. 79% HCW had cough, 72% dyspnoea, 18.8% chest pain, 18,8% sore throat, 18.8% nausea/vomiting, 15.6% abdominal pain, 21.9% diarrhoea, 28.1% fatigue, 28.1% myalgias or arthralgia, 6.3% altered level of consciousness, 15.6% headaches and 34% gastrointestinal

							symptoms. Fever was documented in 93.8%; 81% required intubation and mechanical ventilation. Antiviral therapy was used in a total of 43.8% HCW, whereas oseltamivir was used empirically as part of the management of severe acute respiratory infection in 84% HCW pending influenza PCR results.
(Son et al., 2019)	Korea	Multi-professional	280	32.4±8.2	74.3	3/5	18.6% of HCW were at risk of PTSD. The total score and sub-scores for each component of PTSD were higher in HCW compared to non-HCW. Willingness results indicated HCW were willing to work and was increased by high coping ability in both groups, ($p<0.01$). The score for emotional experience (5.6±0.1), indicated that most participants experienced negative emotions.

[a]Data corresponds to the median age.

ECMO: Extracorporeal membrane oxygenation; EIA: enzyme immunoassay; HCW: healthcare workers; ICU: intensive care unit; MERS: Middle East Respiratory Syndrome; MMAT: Mixed Methods Appraisal Tool; N.a: not available; PTSD post-traumatic stress disorder; PaO2/FiO2: arterial oxygen partial pressure/fractional inspired oxygen; PCR: Polymerase Chain Reaction; Q: qualitative study; RT-PCR: Reverse Transcription-Polymerase Chain Reaction; WHO: World Health Organization.

eTable VI: Main characteristics of the included studies of the impact of COVID-19 on HCW

Study	Country	HCW involved	Sample size	Age: mean ±SD	Sex (% female)	MMAT	Key findings
(Bai et al., 2020)	China	Multi-professional	118	31.1±5.8	63.6	3	A higher proportion of HCW infected by COVID-19 had engaged in night shift-work (p=0.023) and felt they were working under pressure (p=0.022) compared to HCW who had not been infected. HCW infected by COVID-19 had more stress and sleep problems than HCW who had not been infected (p<0.001).
(Bettinsoli et al., 2020)	Italy	Multi-professional	580	N.a.	59	4	86% HCW experienced moderate–to–severe psychological distress during the outbreak. Female HCW reported a higher risk of incurring in poor psychical and mental health (p<0.05) compared to male HCW.
(Cao et al., 2020b)	China	Nurses	37	32.8±9.6	78.4	3/5	Q: To reduce the transmission risk, HCW had to be in the hospital constantly for 2–3 weeks and be 2 weeks in an isolated resort after that before going home. The work time schedule was continuously adjusted and physicians had a heavy workload, causing significant stress. 6.3% physicians felt nervous after hearing the news that other physicians had been infected. 52.6% of nurses reported negative emotions including worrying about the infection and missing their family. 45.9% reported mild bodily discomfort. Burnout was related to the lack of definitely effective medication against COVID-19.
(Chu et al., 2020)	China	Multi-professional	54	39	33.3	4/5	From 54 HCW infected with COVID-19 working in inpatient units, 20.4% HCW´s syndrome was classified as common type COVID-19, 74.1% as severe type and 5.6% as critical type. 70.4% were positive for the test. 29.6% were diagnosed due to changes in CT-scans. The most common symptoms were fever (66.7%) and cough (31.5%). Other symptoms were diarrhoea (5.6%), chills (3.7%), sore throat (1.9%), chest tightness (7.4%), dyspnoea (9.3%), rhinorrhoea (1.9%), fatigue (16.7%), inappetence (5.6%), expectoration (5.6%), nausea (1.9%), muscle ache (5.6%), and globus sensation (1.9%). 57.4% of patients received antimicrobial agents. 38.9% of patients were given corticosteroids. Immunoglobin, interferon, and thymosin were initiated in 33.3%, 33.3%, and 7.4% of patients, respectively Significantly higher proportion of common-type patients received interferon compared with that of severe/critical patients (63.6% vs 25.6%; p=0.023)
(Dai et al., 2020)	China	Multi-professional	4357	35±8.6	76.5	4	39.1% of HCW developed psychological distress. Main concerns for HCW were infection of colleagues (72.5%), infection of family members (63.9%), protective measures (52.3%) and medical violence (48.5%). 34.7% were worried about the risk of self-infection. 46.3% expressed confidence (46.3%) or high confidence (9.1%) in the current grassroots prevention and control strategy. Nurses were more worried about their own infection at work than physicians, technicians and support personnel (p<0.001). Female respondents were more worried about infection and violence, and those who had children were more worried about family members' infection (p<0.001).

(Gao et al., 2020)	China	Multi-professional	1688	N.a.	N.a.	3	The fatality rate was lower among HCW (0.3%) than among the general population (0.6%). Rates of HCW in severe conditions decreased significantly with time, from 19.7% (Jan 11–20) to 14.4% (Jan 21–31) to 8.7% (Feb 1–11). 4% of Chinese HCW outside Wuhan city were in severe condition, and 0% died.
(Guo et al., 2020)	China	Physicians	24	36.1±6.3	4.2	3.5/5	Orthopaedic surgeons with COVID-19 had fever (83.3%), cough (62.5%), fatigue (70.8%), diarrhoea (37.5%), headache (33.3%), shortness of breath (4.2%), muscle ache (4.2%), chest congestion (4.2%) and chest pain (4.2%). They displayed lymphopenia (58.3%), increased C-reactive protein (25%), and leukopenia (12.5%). Not wearing N95 respirators was found to be a risk factor (OR=5.20, 95% CI=1.1-25.0). 62.5% were admitted to the hospital to be treated, and 37.5% were self-isolated at home or hotels with medicine for at least 2 weeks. 100% recovered after treatment.
(Ing et al., 2020)	Worldwide	Physicians	198	63.4	10	2	198 physicians died from COVID-19. Their professions were: 40.6% general practitioners and emergency room physicians, 2.6% pneumologists, 5.7% internal medicine specialists, 3.1% anaesthesiologists 2% epidemiologists, 2% infectious disease specialists, 5% dentists, 4% otolaryngologists and 4% ophthalmologists. Countries with the most reported physician deaths were Italy (40%), Iran (22%), China (8%), Philippines (7%), United States (5%), Indonesia (4%) and France (3%). Lack of personal protective equipment was cited as a common cause of death.
(Kang et al., 2020b)	China	Multi-professional	994	N.a.	85.5	4/5	36.3% HCW received psychological materials, 50.4% obtained psychological resources through media, and 17.5% participated in group psychological counselling. 36% HCW had subthreshold mental health disturbances, 34.4% had mild disturbances, 22.4% had moderate disturbances, and 6.2% had severe disturbances. Those with severe disturbances had access to fewer psychological materials and psychological resources available through media.
(Lai et al., 2020a)	China	Multi-professional	1257	N.a.	76.7	5/5	Several mental health outcomes appeared among HCW treating patients with COVID-19. A considerable proportion of participants had symptoms of depression (50.4%), anxiety (44.6%), insomnia (45%), and distress (71.5%). Severe depression was more frequent in nurses (7.1%) than in physicians (4.9%), p=0.01. Severe anxiety was more frequent among women (5.8%) than among men (3.4%), p=0.001. Severe insomnia was more frequent among frontline workers (1.7%) than among second-line workers (0.4%) (p<0.001).
(Li et al., 2020b)	China	Physicians	24	50.5[a]	83.3	3/5	COVID-19 infection was the most common cause of death for physicians during COVID-19 pandemic (54.2%). 33.3% suffered from sudden death (e.g. cardiac arrest or myocardial infarction) and 12.5% died in a traffic accident. Transmission of COVID-19 occurred in the hospital setting. There were more medical staff working in Hubei (84.6%) and Wuhan (69.2%) Median of the period from admission to death was 26 days.
(Li et al., 2020d)	China	Nurses	526	29.0-29.5[a]	85.6	3.5/5	Front-line nurses had lower vicarious traumatization (mental symptoms similar to trauma after having contact with trauma survivors) scores than non-front-line nurses, including scores for physiological and psychological responses (all

							p<0.001). The vicarious traumatization scores of the general public were higher than those of the front-line nurses (p<0.001). No significant differences were found vicarious traumatization scores between the general public and non-front-line nurses.
(Lin et al., 2020)	China	Multi-professional	376	32.2±6.5	77.7	3/5	Adverse skin reactions were reported by 74.5% HCW. Most common eruptions were dryness or scales (68.6%), papules or erythema (60.4%), and maceration (52.9%). The most frequently affected areas were hands (84.6%), cheeks (75.4%) and nasal bridge (71.8%). Female sex (OR=1.9, p=0.038), working in hospitals with more severe epidemic (OR=2.4, p=0.001), working in inpatient wards (OR=2.4, p=0.003), and duration with full-body personal protective equipment of more than 6 hours per day (OR=4.3, p<0.001) were associated with increased adverse skin reactions.
(Liu et al., 2020a)	China	Multi-professional	600	N.a.	84.6	4	32.0% of HCW had direct contact with infected patients. Prevalence of anxiety was 12.5%. HCW with direct contact that higher anxiety levels (p=0.007). HCW who quarantined and suspected cases had increased anxiety scores.
(Huang et al., 2020c)	China	Multi-professional	64	35[a]	64	3	Fever (67%), cough (47%) and fatigue (34%) were the most commons symptoms. Other symptoms were sore throat (25%), myalgia (22%), dyspnoea (16%), sputum production (13%), headache (13%), chills (5%), loss of appetite (6%), diarrhoea (5%) and chest pain (3%). The median time interval between symptoms onset and admission was 8.5 days. 80% of HCW had abnormal IL-6 levels and 34% lymphocytopenia. In chest CT, bilateral (61%), septal/subpleural (80%) and ground-glass (52%) opacities were found. 34% of HCW were discharged. BMI ≥ 24 kg/m2 (HR=0.14), fever (HR=0.24) and high IL-6 levels on admission (HR=0.31) were unfavourable factors for discharge.
(Kluytmans-van den Bergh et al., 2020)	The Netherlands	Multi-professional	86	49[a]	83	2	53% HCW had fever during the course of illness; other 12% reported a feverish feeling. 93% met the case definition of fever, coughing and/or shortness of breath. Other symptoms reported: fever (53%), coughing (77%), shortness of breath (38%), sore throat (40%), runny nose (53%), malaise (76%), myalgia (62%), headache (57%), chest pain (29%), abdominal pain (6%), diarrhoea or loose stools (19%), loss of appetite or nausea (17%) and altered or loss of taste (7%). 2% of HCW were admitted to the hospital and did not develop any critical disease. 3% HCW reported to have been exposed to an inpatient known with COVID-19 prior to the onset of symptoms, and 63% mentioned to have worked while being symptomatic.
(Mo et al., 2020)	China	Nurses	180	32.7±6.5	90	3/5	Stress and anxiety in nurses were significant. Anxiety was higher than national standard point levels p<0.001. Being an only child (p<0.001), working hours per week (p=0.048), and anxiety (p<0.001) were the main factors affecting nurse stress.
(Qi et al., 2020)	China	Multi-professional	1306	33.1±8.4	80.4	4	Compared to non-HCW, HCW had significantly more sleeping problems (p<0.0001), anxiety (p＜0.0001) and depression (p=0.0010). Prevalence of sleep disturbances was significantly higher in females (70.3%) than males (54.6%).

(Simione and Gnagnarella, 2020)	Italy	Multi-professional	167	35.6±9.9	80	3	HCW working in North Italy reported higher stress scores than HCW working in centre (p<0.01), South Italy, (p<0.01) and non-HCW (p<0.05). HCW in North Italy had higher anxiety levels (p<0.05). 71% HCW considered to be at risk, and 93% were more worried about familiar or loved. 73% of them reported worries about the global socio-political implication of virus spread, and 83% about the possible collapsing of the national health system. 73% were worried about increased aggression risk for HCW in the near future.
(Ran et al., 2020)	China	Multi-professional	72	69.4	31	4/5	38.9% of the HCW with acute respiratory illness had COVID-19. They suffered from: fever (85.7%), cough (60.7%), bradypnea (7.1%), chest distress (7.1%), headache (7.1%), diarrhoea (7.1%), and haemoptysis (7.1%). Relative risks of unqualified handwashing (RR=2.6), suboptimal hand hygiene before (RR=3.1) and after (RR=2.4) contact with patients, and improper personal protective equipment (RR=2.82) were statistically significant (all p<0.05). HCW in the high-risk department group had 2.1 times higher risk in developing COVID-19 compared with the general department group.
(Zhu et al., 2020)	China	Multi-professional	5062	N.a.	85	4	29.8% HCW reported stress, 13.5% depression and 24.1% anxiety symptoms. Being female (p=0.032), having worked for > 10 years (p<0.001), having concomitant chronic diseases (p<0.001), history of mental disorders (p<0.001) and having family members or relatives with confirmed or suspected infection (p=0.030) were risk factors for stress. Care provided by hospital and department administrators (OR=0.7, p=0.024) and full coverage of all departments with protective measures (OR=0.69, p=0.004) were protective factors.
(Tan et al., 2020)	Singapore	Multi-professional	470	31[a]	68.3	4.5/5	Prevalence of anxiety in HCW was 14.5%. 8.9% screened positive for depression, 6.6% for stress, and 7.7% for clinical concern of PTSD. The prevalence of anxiety was higher among non-HCW (20.7%) than medical personnel (10.8%), (p=0.011). Higher stress was observed in non-medical HCW.
(Yifan et al., 2020)	China	Nurses	140	29.3±4.9	84.3	4/5	When treating COVID-19 patients in Wuhan, nurses showed a 2.0±2.1 somatic symptom disorder symptoms and 3.9±6.1 symptom onsets. They suffered chest-discomfort and palpitations (31.4%), dyspnoea (30.7%), nausea (21.4%), headache (19.3%), dizziness (17.9%), xerostomia (15.7%), fatigue (15.0%), sleepiness (9.3%), sweating (8.6%) and waist pain (7.1%), being dyspnoea, chest-discomfort and palpitations and headaches the most severe. Sexual activity, sputum splashes, urine/faeces splashes and urine/stool elimination were risk factors for the appearance of symptoms (P <0.05).
(Zhang et al., 2020)	China	Multi-professional	927	N.a.	73.1	3.5/5	HCW had higher prevalence rates of insomnia (38.4% vs. 30.5%, p<0.01), anxiety (13.0% vs. 8.5%, p<0.01), depression (12.2% vs. 9.5%; p=0.04), somatization (1.6 % vs. 0.4%; p<0.01), and obsessive-compulsive symptoms (5.3% vs. 2.2%; p<0.01) than non-HCW. Their insomnia (p<0.01), generalized anxiety disorder (p<0.01), depression (p=0.01), and obsessive-compulsive symptoms (p<0.01) scale results were higher than non-HCW. Living in rural areas (OR=2.2, 95% CI=1.4-3.3), contact with COVID-19 patients (OR=2.5,

							95% CI=1.7-3.7) and organic diseases (OR=3.4, 95% CI=2.2-5.2) were associated with insomnia; Female sex (OR=1.8, 95% CI=1.1-2.9), living in rural areas (OR=1.9, 95% CI=1.1-3.2), contact with COVID-19 patients (OR=2.1, 95% CI=1.3-3.3) and organic diseases (OR=2.8, 95% CI=1.7-4.7) were associated with anxiety. Female sex (OR=1.8, 95% CI=1.1-3.1) and organic diseases (OR=2.5, 95% CI=1.5-4.2) were associated with depression. Living in rural areas (OR=4.8, 95% CI=1.5-14.8) and organic diseases (OR=7.9, 95% CI=2.7-22.6) were associated with somatization symptoms. Living in rural areas (OR=2.5, 95% CI=1.2-5.1), contact with COVID-19 patients (OR=3.3, 95% CI=1.7-6.1) and organic diseases (OR=2.2, 95% CI=1.1-4.7) were associated with obsessive-compulsive symptoms in HCW (all $p<0.05$).

[a]Data corresponds to median age.

BMI: Body mass index; COVID-19: Novel Coronavirus 2019; HCW: Healthcare Workers; IES: Impact Event Scale; Il-6: interleukin 6; MMAT: Mixed Methods Appraisal Tool; N.a: not available; PCR: Polymerase Chain reaction; PTSD: Post-Traumatic Stress Disorder; Q: qualitative study.

eTable VII: Meta-regressions between physical health outcomes in HCW with SARS/MERS/COVID-19 infection and moderating factors.

Outcome		No. of Studies	β Coefficient	SE	95% CI		Z-Value	P value
Chills	Sex	6	0.054	0.050	-0.044	0.152	1.077	0.281
	Age	6	-0.227	0.217	-0.653	0.198	-1.047	0.295
	Study quality	7	-0.194	1.733	-3.590	3.201	-0.112	0.911
	Professional category	7	-0.656	1.958	-4.494	3.180	-0.335	0.737
	Data source	7	-0.353	1.258	-2.818	2.113	-0.281	0.779
Cough	Sex	13	-0.005	0.009	-0.024	0.013	-0.575	0.565
	Age	13	0.029	0.018	-0.006	0.065	1.606	0.108
	Study quality	14	-0.105	0.248	-0.592	0.382	-0.424	0.671
	Professional category	14	-1.311	1.178	-3.619	0.997	-1.113	0.266
	Data source	14	-0.028	0.520	-1.048	0.992	-0.053	0.958
Diarrhoea	Sex	8	-0.003	0.015	-0.032	0.027	-0.185	0.853
	Age	8	-0.024	0.028	-0.079	0.030	-0.870	0.384
	Study quality	9	0.039	0.540	-1.020	1.099	0.072	0.942
	Professional category	9	-1.390	1.563	-4.453	1.672	-0.889	0.374
	Data source	9	-1.080	0.899	-2.843	0.682	-1.201	0.230
Dyspnoea	Sex	10	0.021	0.013	-0.004	0.048	1.641	0.101
	Age	10	0.009	0.045	-0.078	0.096	0.203	0.839
	Study quality	12	-0.573	0.335	-1.230	0.085	-1.707	0.088
	Professional category	12	2.414	1.286	-0.107	4.936	1.877	0.061
	Data source	12	0.604	0.682	-0.732	1.940	0.886	0.375
Fatigue	Sex	5	-0.025	0.021	-0.066	0.016	-1.199	0.203
	Age	5	-0.309	0.226	-0.753	0.134	-1.367	0.172
	Study quality	6	-1.014	1.079	-3.130	1.102	-0.939	0.347
	Professional category	6	-1.486	1.676	-4.770	1.799	-0.887	0.375
	Data source	6	-1.486	1.676	-4.770	1.799	-0.887	0.375
Fever	Sex	11	-0.007	0.012	-0.030	0.016	-0.603	0.546
	Age	11	-0.014	0.026	-0.064	0.037	-0.534	0.593
	Study quality	12	0.227	0.439	-0.633	1.087	0.516	0.606
	Professional category	12	1.889	1.819	-1.676	5.455	1.039	0.299
	Data source	12	-1.380	0.800	-2.949	0.188	-1.724	0.084
Headaches	Sex	10	0.016	0.015	-0.014	0.045	1.053	0.292
	Age	10	-0.051	0.029	-0.108	0.006	-1.751	0.080
	Study quality	11	-0.581	0.409	-1.383	0.220	-1.421	0.155
	Professional category	11	-0.081	1.200	-2.432	2.270	-0.068	0.946
	Data source	11	-1.091	0.762	-2.583	0.402	-1.432	0.152

Myalgias	Sex	12	0.041	0.013	0.016	0.066	3.234	0.001
	Age	12	-0.001	0.047	-0.094	0.091	-0.031	0.976
	Study quality	13	-0.619	0.343	-1.291	0.052	-1.808	0.071
	Professional category	13	3.127	1.650	-0.106	6.361	1.896	0.058
	Data source	13	0.402	0.796	-1.158	1.961	0.505	0.614
Nausea/vomits [a]	Sex	5	0.032	0.078	-0.022	0.086	1.177	0.239
	Age	5	-0.022	0.097	-0.213	0.168	-0.227	0.820
	Study quality	6	-0.053	0.356	-0.750	0.644	-0.148	0.882
Sore throat [b]	Sex	7	0.035	0.012	0.011	0.058	2.907	0.004
	Age	7	0.015	0.042	-0.067	0.096	0.351	0.726
	Study quality	8	-0.507	0.264	-1.024	0.010	-1.923	0.054
	Professional category	8	-0.886	0.726	-2.310	0.538	-1.220	0.222

[a]Professional category could not be analysed due to all studies being multi-professional; Data source could not be analysed due to all studies being interviews/evaluations.
[b] Data source could not be analysed due to all studies being interviews/evaluations.

eTable VIII: Meta-regressions between poor mental health outcomes in HCW exposed to SARS/MERS/COVID-19 and moderating factors.

Outcome [a]		No. of Studies	β Coefficient	SE	95% CI		Z-Value	P value
Psychological distress	Sex	15	0.032	0.010	0.012	0.052	3.131	0.003
	Age	11	-0.106	0.031	-0.168	-0.045	-3.383	<0.001
	Quality Assessment	15	-0.377	0.579	-1.512	0.758	-0.650	0.515
	Professional category	15	-2.760	0.652	-4.038	-1.482	-4.232	<0.001 [b]
	Data source	15	0.164	0.888	-1.575	1.904	0.185	0.853
Anxiety features [c]	Sex	6	-0.001	0.068	-0.134	0.132	-0.020	0.984
	Age	4	0.001	0.191	-0.373	0.375	0.005	0.996
	Quality Assessment	6	0.713	0.961	-1.170	2.597	0.742	0.458
	Data source	6	-0.191	1.446	-3.025	2.643	-0.132	0.895
PTSD features	Sex	10	-<0.001	0.021	-0.042	0.042	-0.001	0.999
	Age	7	-0.014	0.025	-0.063	0.036	-0.548	0.584
	Quality Assessment	11	0.097	0.313	-0.516	0.710	0.310	0.756
	Professional category	11	-0.067	0.403	-0.857	0.722	-0.167	0.867
	Data source	11	-0.160	0.643	-1.421	1.101	-0.248	0.804
Depressive symptoms	Sex	8	0.026	0.073	-0.117	0.170	0.362	0.717
	Age	4	0.002	0.153	-0.297	0.301	0.013	0.989
	Quality Assessment	8	-0.665	1.119	-2.858	1.528	-0.594	0.552
	Professional category	8	0.182	1.945	-3.631	3.996	0.094	0.925
	Data source	8	-0.100	9.971	-2.00	1.803	-0.103	0.918
Insomnia	Sex	6	0.008	0.043	-0.076	0.0916	0.188	0.851
	Age	4	-0.031	0.132	-0.290	0.228	-0.235	0.814
	Quality Assessment	6	0.408	1.096	-1.739	2.556	0.373	0.709
	Professional category	6	0.306	1.148	-1.944	2.558	0.267	0.790
	Data source	6	-0.362	0.485	1.313	0.588	-0.747	0.455
Burnout [d]	Sex	3	-0.007	0.005	-0.016	0.002	-1.470	0.141
	Quality Assessment	3	-0.175	0.098	-0.367	0.016	-1.791	0.073
	Professional category	3	-0.297	0.170	-0.631	0.037	-1.74	0.082
	Data source	3	-0.566	0.629	-1.800	0.666	-0.903	0.368
Fear	Quality Assessment	4	-0.058	0.065	-0.186	0.071	-0.878	0.380
	Professional category	4	-0.108	0.073	-0.252	0.036	-1.472	0.141
	Data source	4	-0.446	0.337	-1.107	0.215	-1.323	0.186

[a] Stigmatization feelings, general health concern and somatization could not be analysed due to the limited number of studies; [b] Physicians vs nurses p<0.001; Physicians vs multi-professional p=0.360; Nurses vs multi-professional p<0.001;[c] Professional category could not be analysed due to all studies being multi-professional;[d] Age could not be analysed due to the limited number of studies; [e] Sex and age could not be analysed due to the limited number of studies.

eMethods 1: Quality assessment: Mixed Methods Appraisal Tool (MMAT)

Risk of bias was assessed using a modified version of the Mixed Methods Appraisal Tool (MMAT) due to the heterogeneity expected in the included studies. We followed the tool´s four steps:

Step 1: Enter information on the papers you are appraising.

Step 2: Respond to the screening questions to assess eligibility:

1. Are there clear research questions?
2. Do the collected data allow to address the research questions?

Step 3: Choose the categories of studies to appraise: qualitative studies; randomised controlled trials; non-randomised studies; quantitative descriptive studies; or mixed methods studies)

Step 4: Rate the criteria of the chosen category from 0 to 5 according to the answer to the following questions depending on the appropriate category

- Qualitative studies
  1. Is the qualitative approach appropriate to answer the research question?
  2. Are the qualitative data collection methods adequate to address the research question?
  3. Are the findings adequately derived from the data?
  4. Is the interpretation of results sufficiently substantiated by data?
  5. Is there coherence between qualitative data sources, collection, analysis and interpretation?
- Randomized controlled trials
  1. Is randomization appropriately performed?
  2. Are the groups comparable at baseline?
  3. Are there complete outcome data?
  4. Are outcome assessors blinded to the intervention provided?
  5. Did the participants adhere to the assigned intervention?
- Non-randomized studies
  1. Are the participants representative of the target population?
  2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?
  3. Are there complete outcome data?
  4. Are the confounders accounted for in the design and analysis?
  5. During the study period, is the intervention administered (or exposure occurred) as intended?
- Quantitative descriptive studies
  1. Is the sampling strategy relevant to address the research question?
  2. Is the sample representative of the target population?
  3. Are the measurements appropriate?
  4. Is the risk of nonresponse bias low?
  5. Is the statistical analysis appropriate to answer the research question?
- Mixed methods studies
  1. Is there an adequate rationale for using a mixed-methods design to address the research question?
  2. Are the different components of the study effectively integrated to answer the research question?
  3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?
  4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?
  5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

eMethods II: Operationalization of exposure to or infection by MERS/SARS/COVID-19 in HCW

Exposure to MERS/SARS/COVID-19 in HCW was operationalized as being involved directly or indirectly in the care of SARS/MERS/COVID-19 patients (Son et al., 2019).
Eighty studies evaluated physical and mental health outcomes in HCW exposed to MERS/SARS/COVID-19. In 54 of them (67.5%), all HCW had direct contact with infected patients and in 26 of them (32.5%) HCW with both direct and indirect contact with infected patients were included.

MERS/SARS/COVID-19 infection status was operationalised as confirmed or suspected infection. Confirmed infection status was evaluated by serological (such as antigen tests or serological assay methods as ELISA (Lu et al., 2020b; Richardson et al., 2004)) or molecular (such as PCR-based procedures (Lu et al., 2020b; Pascarella et al., 2020; Richardson et al., 2004)) testing. Suspected infection status was evaluated by using clinical elements from WHO guidance (history of exposure, symptoms, pathogen test, chest computed tomographic –-CT- scan, and haematological examination, PCR or antibody tests) (World Health Organization., 2020). Studies in which the diagnosis was not confirmed by serological or molecular testing (including those that used neuroimaging findings (Lu et al., 2020b)) were excluded from the meta-analysis.
Thirty-five studies evaluated physical and mental health outcomes in HCW infected by MERS/SARS/COVID-19, in 6 (17.1%) studies HCW had a confirmed infection by serological testing; in 7 (20.0%) studies HCW had a confirmed infection by molecular testing; in 12 (34.3%) studies, both serological and molecular testing were used to confirm the diagnosis and in 10 (28.6%) diagnosis was suspected or confirmed using elements from WHO guidance.

A vast majority of studies focused on mental health outcomes in HCW exposed to MERS/SARS/COVID-19 (75 studies, 65.2%) or physical health outcomes in HCW with MERS/SARS/COVID-19 infection (32 studies, 27.8%). Conversely, only a few studies reported on mental health outcomes in HCW with MERS/SARS/COVID-19 infection (5 studies, 4.3%) or on physical health outcomes in HCW exposed to MERS/SARS/COVID-19 (3 studies, 2.6%).

eResults I: Systematic review of physical health outcomes in HCW with SARS/MERS/COVID-19 infection

SARS: Most frequently reported physical symptoms were fever 96.3% (95% CI=76.3%-99.5%) and fatigue 80% (95% CI=73.8%-86.2%) (the top 10 most frequently reported symptoms in MERS/SARS/COVID-19 are displayed in Table 1, Figure 2). Anorexia was very common in HCW with SARS infection and appeared in up to 70-100% (Avendano et al., 2003; Reynolds et al., 2006). Other physical symptoms experienced by HCW included back pain (34%) (Chan et al., 2005) and dizziness (5%) (Ho et al., 2003). Other reported complications included avascular necrosis (Law et al., 2008). Due to wearing protection equipment, adverse skin reactions - 35.5% with masks and 21.4% with gloves (Foo et al., 2006)- and headaches were suffered as well by 37.3% of exposed HCW (Lim et al., 2005).

Changes in blood count appeared commonly, including anaemia (19%-64.3%) (Avendano et al., 2003; Chiu et al., 2004), leukopenia (38%) (Chiu et al., 2004), lymphopenia (75%) (Chiu et al., 2004) and thrombocytopenia (38%) (Chiu et al., 2004) in HCW. Fourteen months after being discharged from the hospital, 7.7% had mild restrictive abnormalities, and 61.5% had decreased carbon monoxide diffusing capacity (DLCO) levels (Su et al., 2007a). Most HCW had to change their clinical practice (Wong et al., 2004c) and 13.1% HCW had to take a leave of absence >7 days (Puro et al., 2006). Performing invasive manoeuvres, having contact with respiratory secretions or sputum and working in emergency care appeared as risk factors, while using protective equipment, training and taking prophylactic medicine protected against infection (Liu et al., 2009). In fact, HCW with asymptomatic SARS were more likely to have used masks (50%) than HCW that developed pneumonic SARS (8%), p=0.025 (Wilder-Smith et al., 2005). Almost 60% medical residents believed that SARS compromised their education (Rambaldini et al., 2005). 6.2% of infected medical students required mechanical ventilation and treatment in the ICU, although 100% recovered from the illness (Wong et al., 2004b). Another study found a mortality rate of 6.2% in HCW, including physicians and nurses (Chiu et al., 2004). Three intervention studies were found targeting SARS, two of them focusing on physical health outcomes. The first non-randomized study found that 0% (0/1063) HCW who took herbal supplements contracted SARS while 0.4% (64/15,374) HCW in the control group contracted it (p=0.014) (Lau et al., 2005). HCW who took supplements had less throat (p<0.001) or stool problems (p<0.001) after 28 days (Lau et al., 2005). In the second non-controlled study (n=17), ribavirin and methylprednisolone for those HCW who developed pneumonia resulted in all of them recovering without major sequelae or subsequent relapse (Sun et al., 2003) (eTable IV).

MERS: Most frequently reported physical symptoms in MERS were fever 67.1% (95% CI=34.2%-88.9%) and dyspnoea 53.8% (95% CI=26.2%-79.3%) (the top 10 most frequently reported symptoms are displayed in Table 1, Figure 2). Other symptoms included runny nose (31.6%) (Alraddadi et al., 2016b), joint pain (11%) (Hunter et al., 2016) and rash (5%) (Alraddadi et al., 2016b). Dizziness due to the protective clothing was also experienced (Im et al., 2018). A study found that 22.2% HCW infected by MERS suffered severe pneumonia and 33.3% mild pneumonia (Alshukairi et al., 2016). Being infected in a later year and having no comorbid conditions were protective factors for death in MERS (Elkholy et al., 2020). 10% HCW working in units that treated MERS patients had moderate illness requiring hospital admission and 15% had severe illness requiring mechanical ventilation (Alraddadi et al., 2016b). In a sample of critically ill HCW, 81% required intubation and mechanical ventilation. In 43.8% of them antiviral therapy was used and in 84% oseltamivir (Shalhoub et al., 2018). 25% of those critically ill HCW died (including 100% of those with previous chronic renal impairment) (Shalhoub et al., 2018). However, the fatality rate in another study was found to be lower in HCW (16%) than in non-HCW (34%), p=0.001 (Al-Tawfiq and Memish, 2019). No clinical trials were found (eTable V).

COVID-19: Most frequently reported physical symptoms in COVID-19 were fever 71.4% (95% CI=57.6%-82.0%) and cough 56.2% (95% CI=39.87-71.5%) (the top 10 most frequently reported symptoms in MERS/SARS/COVID-19 are displayed in Table 1, Figure 2). Other symptoms in

HCW included fatigue (16.7%) (Chu et al., 2020), inappetence (5.6%) (Chu et al., 2020), expectoration (5.6%) (Chu et al., 2020), chest pain (4.2-7.4%) (Chu et al., 2020; Guo et al., 2020) and congestion (4.2%) (Guo et al., 2020), rhinorrhoea (1.9%) (Chu et al., 2020) and globus sensation (1.9%) (Chu et al., 2020). Adverse skin reactions to protective equipment were reported by 74.5% HCW (Lin et al., 2020). HCW in the high-risk areas had 2.1 times higher risk of developing COVID-19 compared to the HCW working in other areas (Ran et al., 2020). Female HCW had a higher risk of incurring in poor psychical health ($p<0.05$) (Bettinsoli et al., 2020). HCW infected by COVID-19 more frequently had engaged in night shift-work (75.0% vs 40.6%) and felt they were working under pressure (66.7% vs 32.1%) compared to uninfected HCW (Bai et al., 2020). From HCW infected with COVID-19 working in inpatient units, 20.4% HCW were classified as common type, 74.1% as severe type, 5.6% as critical type (Chu et al., 2020). In laboratory analysis HCW displayed lymphopenia (34%-58.3%) (Guo et al., 2020; Huang et al., 2020c) increased C-reactive protein (25%) (Guo et al., 2020), leukopenia (12.5%) (Guo et al., 2020) and abnormal IL-6 levels (Huang et al., 2020c). In chest CT, bilateral (61%), septal/subpleural (80%) and ground-glass (52%) opacities were found (Huang et al., 2020c). In 7.4% HWC with COVID-19, antimicrobial agents were used, in 38.9% systematic corticosteroids were given, in 33.3% immunoglobins, in 33 % interferon and in 7.4% HCW thymosin (Chu et al., 2020). Although all HCW recovered in one of the included studies (Guo et al., 2020), and the fatality rate was lower among medical HCW (0.3%) than among the general population (0.6%) (Gao et al., 2020), COVID-19 infection was the most common cause of death for physicians during COVID-19 pandemic (54.2%) according to another (Li et al., 2020b), with median 26 days after admission (Li et al., 2020b). 40.6% of those physicians who died were general practitioners and emergency room physicians (Ing et al., 2020). No clinical trials were found (eTable VI).

eResults II: Systematic review of mental health outcomes in HCW exposed to SARS/MERS/COVID-19 infection

SARS: Most frequently reported poor mental health outcomes by HCW exposed to SARS were health concerns 62.5% (95% CI=57.0%-67.8%), and anxiety features 45.7% (95% CI=5.1%-93%) (the top 10 most frequently reported outcomes in MERS/SARS/COVID-19 are displayed in Table 2, Figure 3). 11% of nurses suffered from stress reaction syndrome (Chen et al., 2005). Eighteen months after discharging their last SARS patient, 5% of HCW presented new episodes of psychiatric disorders. Emotional reactions were common in HCW in the analysed studies, including annoyance (79.1%) (Reynolds et al., 2008), frustration (73.2%) (Reynolds et al., 2008) or anger (41.6%) (Reynolds et al., 2008). Fear was common (Avendano et al., 2003; Ho et al., 2005; Koh et al., 2005a; Maunder et al., 2003; Reynolds et al., 2008; Robertson et al., 2004) and reached 43.7% (95% CI 33.9%-54.0) according to our meta-analysis. 38.2% (95% CI 19.5%-61.3%) experienced burnout (Maunder et al., 2006; Pratt et al., 2009). 42% of HCW did not feel appreciated by the society (Styra et al., 2008) or felt people avoided them (49%) or their family (31%) due to their job (Koh et al., 2005a).

Alcohol-related symptoms appeared in 19% HCW, particularly in those quarantining (OR=1.6, 95% CI=1.1-2.6) or exposed at work (OR=1.7, 95% CI=1.1-2.6) (Wu et al., 2008). Those HCW providing direct care (Chen et al., 2007; Grace et al., 2005; Verma et al., 2004) and those more inexperienced (Chong et al., 2004) or part-time employed (OR=2.6, 95% CI=1.2-5.4) were more distressed. Depression was higher in HCW working in SARS (38.6%) than in non-SARS units (3.2%), $p<0.001$(Su et al., 2007b). Being single, having been quarantined or exposed to other traumatic events before SARS (all $p<0.001$), increased the odds of having high levels of depressive symptoms 3 years after SARS outbreak (Liu et al., 2012). HCW who quarantined (OR=3.5, 95% CI=1.9-6.2), worked in high-risk locations (OR=3.1, 95% CI=1.8-5.5) or had friends or close relatives who contracted SARS (OR=3.7=1.8-7.6), were more likely to have high posttraumatic stress symptoms (all $p<0.001$) (Wu et al., 2009) than those without this risk factors. Family support ($p=0.003$) was associated with lower anxiety levels (Chen et al., 2006). For HCW, encouragement among peers (100%), enough rest and time off (96%) and appropriate work shifts (96%) were all helpful in reducing stress and restoring their energy levels (Lee et al., 2005). Minor psychiatric morbidity reached 47.8% in HCW in one of the included studies (Lin et al., 2007). When hospital returned to normal operations, nursing personnel exhibited lower anxiety levels ($p<0.0001$), lower depression levels ($p<0.0001$), and better sleep quality ($p=0.0008$) than before (Chen et al., 2006). Two intervention studies were found focusing on mental health outcomes in HCW exposed to SARS. The first non-randomized study found that HCW who took supplements had less sleep problems after 28 days ($p<0.001$) (Lau et al., 2005). They also found an improvement in mental health score ($p<0.001$) and vitality ($p=0.01$) after 28 days (Lau et al., 2005). The second non-controlled study (n=116) found, one month after establishing a SARS prevention program, that HCW exhibited lower anxiety ($p<0.0001$) and depression levels ($p<0.0001$), and better sleep quality ($p=0.0008$) than before (Chen et al., 2006) (eTable IV).

MERS: Most frequently reported poor mental health outcomes by HCW exposed to MERS were fear 54.0% (95% CI=35.5%-71.4%) and PTSD features 40.7% (95% CI=19.9%-65.6%) (top 10 most frequently reported outcomes in MERS/SARS/COVID-19 are displayed in Table 2, Figure 3). During the hospital shutdown, 64.1% HCW had PTSD-like symptoms, and 51.5% fulfilled criteria for PTSD diagnosis. A month after the shutdown: in 54.5% PTSD-like symptoms remained, and in 40.3% HCV, PTSD diagnosis (Lee et al., 2018b). Most HCW experienced negative emotions (Son et al., 2019), which included fear (Almutairi et al., 2018; Khalid et al., 2016b) and despair (Almutairi et al., 2018). Denial and underestimation of the seriousness of the disease occurred particularly at the beginning of the pandemic (Almutairi et al., 2018). Burnout affected the quality of the care (Kang et al., 2018a), and this was higher in nurses working with infected patients (Kim and Choi, 2016). Supervisor support had a strong ($\beta=0.177$) buffering effect for PTSD (Jung et al., 2020) (eTable V). During the outbreak 87.8%-91.5% HCW did not feel safe at work (Abolfotouh et al., 2017; Al Ghobain et al., 2017; Alsubaie et al., 2019), particularly due to the ability of the virus to cause severe disease or death (88%) and lack of specific treatment (80%) (Alsubaie et al., 2019). They also felt extreme stress (Khalid et al.,

2016b; Kim, 2018), being the main stressors related to safety (Khalid et al., 2016b), and stigma from society (Kim, 2018). No clinical trials were found (eTable V).

COVID-19: Most frequently reported poor mental health outcomes by HCW exposed to COVID-19 were insomnia 41.7% (95% CI=35.4%-48.3%) and psychological distress 29.7% (95% CI=1.3%-93.3%) (the top 10 most frequently reported outcomes in MERS/SARS/COVID-19 are displayed in Table 2, Figure 3). Somatic symptom disorder symptoms were also reported being chest-discomfort and palpitations (31.4%) and dyspnoea (30.7%) the most frequent (Yifan et al., 2020). HCW experienced higher prevalence rates of somatization (1.6 % vs. 0.4%; $p<0.01$), and obsessive-compulsive symptoms (5.3% vs. 2.2%; $p< 0.01$) than non-HCW (Tan et al., 2020). 6.2% reported severe mental health disturbances (Kang et al., 2020b). 52.6% HCW exposed to COVID-19 reported negative emotions (Cao et al., 2020b). They experienced high-stress levels (Cao et al., 2020b; Puliatti et al., 2020), exacerbated by workload and isolation (Cao et al., 2020b).

Several factors had an influence on poor mental health outcomes. Nurses were more worried about their own infection at work than physicians, technicians and support personnel ($p<0.001$). Female HCW were more worried about infection and violence, and those who had children were more worried about family members' infection ($p<0.001$) (Dai et al., 2020). Being a nurse ($p=0.01$) (Lai et al., 2020a) and working long hours ($p=0.048$) (Puliatti et al., 2020) were risk factors for severe depression. Having worked for >10 years ($p<0.001$) (Zhu et al., 2020), suffering chronic diseases ($p<0.001$) (Zhu et al., 2020), a history of mental disorders ($p<0.001$) (Zhu et al., 2020), having relatives with confirmed or suspected infection ($p=0.030$) and working in areas with high infection rates ($p<0.01$) (Simione and Gnagnarella, 2020) were risk factors for stress. HCW with direct contact (OR=2.1, 95% CI=1.3-3.3);($p=0.007$) (Simione and Gnagnarella, 2020; Zhang et al., 2020), suffering organic diseases (OR=2.8, 95% CI=1.7-4.7) (Zhang et al., 2020) or working in areas with high infection rates ($p<0.01$) (Liu et al., 2020a) had higher anxiety levels. Severe insomnia was more frequent among frontline workers than among second-line workers ($p<0.001$) (Lai et al., 2020a) while contact with COVID-19 patients (OR=2.5, 95% CI=1.7-3.7) and organic diseases (OR=3.4, 95% CI=2.2-5.2) were associated with insomnia (Zhang et al., 2020). Those HCW with severe mental disturbances had accessed fewer psychological support available through media (Kang et al., 2020b). No clinical trials were found (eTable VI).

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